

# *A New Annual Forest Inventory System for the South*

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For more than seven decades, Forest Service FIA (Forest Inventory and Analysis) units have conducted timber resource inventories on a ten-year cycle. Because FIA is the only organization that conducts such inventories on public and private lands, its role in the forest research community has always been unique. Data collected by FIA are presented in extensive, periodic reports that have been used regionally, nationally and internationally to help land managers address sustainability issues, prepare local and regional timber resource assessments, and monitor changes wrought by hurricanes, forest fires and other catastrophic natural events.

In the past, the FIA program focused on broad regions of the country, conducting inventories on a state-by-state basis. Inventory crews measured all

field plots in one state before moving on to the next. Because of that, over the ten-year inventory cycle and within every FIA region, each state's resources were inventoried only once. The process would take two to three years in large states like Alabama and Georgia, but could be completed in one to two years in smaller states like South Carolina. As a result, those inventories proved to be very good for the first couple of years; but, over time, confidence intervals widened and the data became less and less reliable. Also, because the were not connected in time across state lines or other boundaries, cross-jurisdictional planning was, at best, problematic. The accelerating pace of change in forestland status and condition, especially in the South, has made urgent the need for an inventory system that will respond to the issues and demands of the 21st century.

## **EVENTS LEADING UP TO AN ANNUAL INVENTORY SYSTEM**

In the early 1990s, concerns for timely and consistent data led to the formation of a national committee to investigate and make recommendations for changing FIA processes. A Blue Ribbon Panel developed six major recommendations and published a comprehensive report. One recommendation was to develop and begin implementing a five-year inventory cycle. Although field units made some progress toward this goal, shortfalls in funding made full implementation impossible. The need for timely information continued to grow and ultimately led to the formation of Blue Ribbon Panel II (BRPII) in 1997. One of BRPII's major recommendations was the adop-



**TABLE 1. NUMBER OF FORESTED PLOTS AND INVENTORY DATES FOR SOUTHERN STATES**

State	Number of Forested Plots	Last Periodic Inventory	Next Periodic Inventory	SAFIS Implementation
AL	3,944	1990	1999	1997
VA	3,200	1992	2002	1997
GA	4,820	1997	2009	1998
TN	2,361	1989	1998	1998
LA	2,415	1991	2001	1998
SC	2,520	1993	2003	1998
KY	2,460	1988	1999	1999
AR	3,209	1995	2006	1999
NC	3,860	1990	1999	2000
FL	3,240	1995	2006	2000
MS	3,190	1994	2004	2000
TX	3,840	1992	2001	2000
OK	1,500	1993	2003	2000
PR & VI	125	1990	2000	•
<b>Total</b>	<b>40,684</b>			

• Puerto Rico and Virgin Islands will be inventoried under the periodic method

tion of an annual inventory system. The need was further underscored when Congress passed the Agricultural Research, Extension and Education Reform Act of 1998. That important legislation directs FIA program managers to make significant technical changes in the processes they use to inventory the nation's timber resources. More specifically, the act mandates a switch from periodic to annual (continuous) inventories, in which 20 percent of all inventory plots in each state are measured each year.

In 1996, the southern FIA unit agreed to collaborate with forest industry representatives and state partners on a project in central Georgia that would "pilot test" a new inventory design. In the system that was selected, the existing set of field plots was divided into five interpenetrating panels, one of which would be measured each year, and each of which would be measured once every five years. Because the FIA unit was then funded to accomplish its work only on a ten-year cycle, this

#### HOW THE NEW ANNUAL SYSTEM WILL WORK

Across the 13 southern states, and in Puerto Rico and the Virgin Islands, FIA crews have established approximately 40,700 forested plots (table 1). The Southern Annual Forest Inventory System (SAFIS) will use the plot system now in place, but will change the order in which plots are visited. Under the new inventory system, 20 percent, or about 8,200 plots, will be measured across the South each year. Those plots not measured in a given year can be updated using statistical methods, alternative monitoring procedures, or both. This allows the information management system to have timely information available for all plots. However, tools to update nonmeasured plots will be available only after they are thoroughly tested and verified. FIA personnel at the Southern Research Station are conducting research on methods for modeling the plots. During the transaction period, and until the rotating five-panel

approach required additional or alternative sources of funding. Due to the mutual interest of southern state foresters, the southern FIA unit decided to skip the pilot test phase and simply implement the annual approach in several southern states.

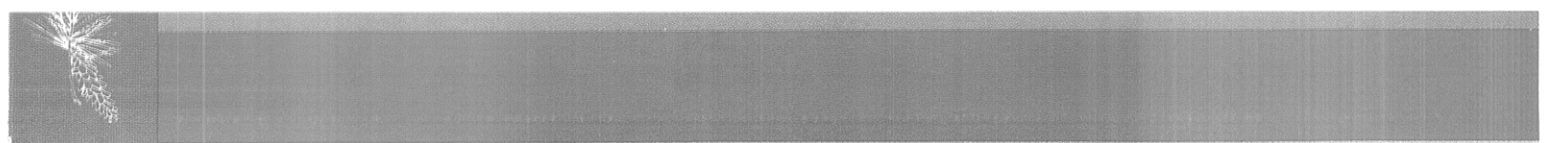
map design is fully implemented in all states, scientists are considering three approaches to analyzing the data:

- 1. Produce annual estimates based only on those plots measured each year.**
- 2. Average the annual data with older data, which will give a more uniform annual estimate.**
- 3. Wait until 40 to 60 percent of the state is inventoried, using the new design, before attempting any meaningful analysis.**

Once the rotating five-panel design is fully implemented, several new techniques will be used to provide estimates that are even more reliable. Some techniques can be applied now, while others will require additional research and pilot testing.

Forest area measurements by type and by changes in land use over time are also important components of an annual survey; although any estimate of forestland area may have a high sampling error if it is based solely on FIA field plots. To reduce forestland area sampling error, FIA has long used remote-sensing products (aerial photography) and ground plots (double sampling estimation techniques) to determine forest area. The use of high-resolution satellite data and semi-automated forest area classification algorithms will eventually provide for more frequent forest change estimates under SAFIS. However, in the interim, photo interpretation will continue to provide essential forest area information. In addition, digital classification of satellite imagery can provide complete data for every pixel. With high-resolution data, it may even be possible to identify





and many of the pine plantations, which over the next 20 years are expected to contain 50 percent of the southern pine inventory.

Implementing the new design under SAFIS has presented some logistical challenges. Each year, fieldwork will be conducted across entire states, but at a reduced intensity. Many state forestry officials have offered to become partners with FIA by contributing vehicles, personnel, office and storage space,

and other resources—arrangements that will allow FIA personnel to work faster. Several states are now using their own resources to hire field staff to collect data for the base set of SAFIS plots. In fiscal year 1999, the southern FIA unit will distribute approximately \$1.2 million to eight southern states. So far, that funding has been more than matched by participating states. States have agreed to provide full-time field crews, a full-time project coordinator and suitable vehicles. States have also agreed to measure forest plots and special-studies plots, observe and evaluate nonforest plots, meet all requirements of the Quality Assurance Plan and use predesignated field equipment such as data recorders. Because there will be operations in all 13 states every year, FIA personnel and partner staffs will be engaged in a continuing dialogue, which will likely foster valuable long-term working relationships. Annual fieldwork throughout the region may give partners an opportunity to collect additional data, without having to wait years for the next scheduled inventory.

The Forest Service will provide the field variables and data collection protocols, aerial photographs, training for the field crews and software for data recorders. Forest Service personnel will process, summarize, manage and analyze data, provide a quality assurance plan and oversee its implementation, and conduct research to investigate critical issues related to SAFIS. FIA's major role will be to ensure that high-quality data standards are maintained under the SAFIS system as they have been for more than 70 years.

## STATUS OF IMPLEMENTING SAFIS

In 1997, when southern states started asking to participate in SAFIS, FIA personnel estimated that it could implement it in two states per year while simultaneously conducting their scheduled activities in Georgia and Tennessee. Because Alabama and Virginia have inventories dating from the early 1990s (table 1), the two state foresters discussed SAFIS funding with their respective legislatures. When funds had been granted, the inventory process began. Both states now expect results much sooner than they could under the periodic inventory scheme.

In 1998, due to the extreme interest and pressure from states, the Forest Service FIA unit decided to overlook the two-state limit and implement SAFIS in other states as well. Georgia, Tennessee, South Carolina and Louisiana committed to start SAFIS, and now both Georgia and South Carolina have begun measuring their first 20 percent of plots. Tennessee and Louisiana will begin early this year.

Both Kentucky and Arkansas are scheduled to participate in SAFIS this year. In Kentucky, Forest Service FIA field crews will be matched with state crews. Kentucky crews will be trained to take over measurement of plots in the year 2000, when the entire state has been inventoried. They will then begin implementing SAFIS procedures. In Arkansas, on the other hand, there is no need for completion of an inventory using the old system. Because the state was inventoried in 1995, crews there will begin implementing SAFIS this year. FIA personnel will train and certify Arkansas field crews this summer. Once field crews are trained and certified, two FIA crew members will be permanently appointed to ensure quality



there. All states now conducting the SAFIS program already have two FIA crew members assigned to them.

We hope that by the year 2000, the remaining states—North Carolina, Florida, Mississippi, Texas and Oklahoma—will have committed the financial resources necessary to develop and implement annual inventories. Research and field activities will also be carried out in Puerto Rico and the Virgin Islands, but fieldwork there will continue to be done by periodic inventory.

#### BENEFITS FROM THE NEW ANNUAL INVENTORY SYSTEM

SAFIS has drawn more attention and received wider support than any other research program in the South, and maybe even the nation. Data gathered using the new inventory procedures have produced a number of specific benefits:

1. States are now producing more uniform information.
2. Confidence intervals are more stable from year to year.
3. Managers from various jurisdictions are able to incorporate technological innovations into state inventories.
4. Communication among states has been enhanced by the annual inventory process.
5. With the availability of annual data increasing, resource managers will have a heightened ability to address forest sustainability issues. 🌿



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